WE CLAIM:

1. (currently amended) A router for a polarized light, comprising:

an optical waveguide for guiding said polarized light;

a magneto optic rotator (MOR) for controllably rotating a polarization angle of said polarized light; and

a polarization beam splitter (PBS) seamlessly integrated into said optical waveguide for accepting said polarized light from said MOR, and routing said polarized light according to said polarization angle.

2. (original) The router of claim 1, wherein said MOR comprises:

a first section, wherein in said first section a magnetic field is selectively switched between two modes, and wherein in said two modes said magnetic field has equal magnitudes and opposite directions, whereby in said first section said polarization angle is rotated by a fixed magnitude and selectively in opposing directions; and

a second section following said first section, wherein in said second section a permanent magnetization prevails, whereby in said second section said polarization angle is rotated by a constant value.

3. (currently amended) The router of claim 2, wherein in said first section said fixed magnitude of said polarization angle rotation is approximately 45°, whereby said polarization angle in said first section is selectively rotated approximately by either + 45° or - 45°, and in said second section said constant value of said polarization angle rotation is approximately + 45°, whereby said polarization angle, upon said polarized light passing ~~trough~~ through said first section and said second section, is selectively rotated approximately by either + 90° or by 0°.

4. (currently amended) The router of claim 2, wherein said first section and said second section[[s]] of said MOR are ~~waveguides, wherein each of~~ integrated into said ~~waveguides~~ optical waveguide, each comprising a magneto-optically active layer guiding said polarized light.

5. (currently amended) The router of claim 4, wherein said first section and said second section ~~waveguides~~ further comprising at least one additional optical layer,. said additional optical layer interfacing with said magneto-optically active layer, wherein said additional optical layer having a lower refractive index than said magneto-optically active layer.

6. (canceled)

7. (original) The router of claim 4, wherein said magnetic field in said first section of said MOR is generated by a current flowing in a metallic strip, wherein said metallic strip substantially covering said first section.

8. (original) The router of claim 5, wherein said magneto-optically active layer comprising of Yttrium Iron Garnet (YIG), and said additional optical layer comprising Gadolinium Gallium Garnet (GGG).

9. - 11. (canceled)

12. (currently amended) The router of claim [[11]] 1, wherein said PBS is a vertical polarization grating etched into said optical waveguide ~~network~~.

13. (currently amended) The router of claim [[11]] 1, wherein said PBS is a Brewster angle beam splitter etched into said optical waveguide ~~network~~.

14. (currently amended) The router of claim [[11]] 1, wherein said PBS is a birefringent prism built into said optical waveguide ~~network~~.

15. (currently amended) The router of claim [[10]] 1, wherein said PBS is having asymmetric waveguide output arms, wherein each of said waveguide output arms is capable of propagating light only with one predetermined polarization angle.

16. (currently amended) A routing method for a polarized light in an optical waveguide ~~network~~ comprising the steps of:

controllably rotating a polarization angle of said polarized light in a magneto optic rotator (MOR), wherein said MOR being a segment of said optical waveguide; and

accepting said polarized light from said MOR and routing said polarized light along an optical path ~~by a polarization beam splitter (PBS),~~ in accordance with said polarization angle with a polarization beam splitter (PBS) which is seamlessly integrated into said optical waveguide.

17. - 20. (canceled)

21. (currently amended) In an electronic processor comprising a plurality of processing units, an optical backplane, comprising:

a network of optical waveguides, said optical waveguides guiding a polarized light;

routers for said polarized light [[in]] at vertexes of said network of optical waveguides, each router comprising:

(a) a magneto optic rotator (MOR) for controllably rotating a polarization angle of said polarized light;

(b) a polarization beam splitter (PBS) for accepting said polarized light from said MOR, and routing said light according to said polarization angle, wherein said PBS is seamlessly integrated into said optical waveguides; and

optical devices for operationally connecting said processing units of said electronic processor to said network, wherein said network affords an optical interconnection amongst said processing units.

22. (original) The optical backplane of claim 21, wherein said optical waveguides are planar waveguides.

23. (original) The optical backplane of claim 21, wherein said optical waveguides are strip waveguides.

24. (original) The optical backplane of claim 21, wherein said optical waveguides are cylindrical waveguides.

25. (canceled)

26. (currently amended) The optical backplane of claim [[25]] 21, wherein in each of said routers for said polarized light said MOR comprising:

a first section, said first section comprising a magneto-optically active Yttrium Iron Garnet (YIG) layer guiding said polarized light, and a Gadolinium Gallium Garnet (GGG) layer interfacing with said YIG layer, wherein said GGG layer having a lower refractive index than said YIG layer, said first section further comprising a metallic strip, wherein said metallic strip substantially covering said first section, wherein a current flowing in said metallic strip generating a magnetic field in said first section, wherein said magnetic field being selectively switched between two modes, and wherein in said two modes said magnetic field has equal magnitudes and opposite directions, whereby in said first section said polarization angle is selectively rotated approximately by either + 45° or - 45°; and

a second section following said first section, wherein said second section comprising a second magneto-optically active YIG layer guiding said polarized light, and a second GGG layer interfacing with said second YIG layer, wherein said second GGG layer having a lower refractive index than said second YIG layer, and wherein in said second section a permanent magnetization prevails, whereby in said second section said polarization angle is rotated by approximately + 45°, whereby said polarization angle, upon said polarized light passing trough said first section and said second section, is selectively rotated approximately by either + 90° or by 0°.

27. (canceled)

28. (original) The optical backplane of claim 21, wherein said network of optical waveguides comprising a doped $SiO_2$ layer guiding said polarized light, and an undoped $SiO_2$ layer interfacing with said doped $SiO_2$ layer, wherein said undoped $SiO_2$ layer

having a lower refractive index than said doped $SiO_2$ layer.

29. - 30. (canceled)

31. (currently amended) The optical backplane of claim [[25]] 21, wherein said PBS is having asymmetric waveguide output arms, wherein each of said waveguide output arms is capable of propagating light only with one predetermined polarization angle.

32. (currently amended) The optical backplane of claim [[25]] 21, wherein said optical devices for operationally connecting said processing units comprise a prism coupling optics.

33. (currently amended) The optical backplane of claim [[25]] 21, wherein said optical devices for operationally connecting said processing units comprise a grating coupling optics.

34. (original) The optical backplane of claim 26, wherein said first section and said second section of said MOR, and said network of optical waveguides are being seamlessly meshed together into a coplanar configuration.

35. (original) The optical backplane of claim 26, wherein said first section and said second section of said MOR are external to said network of optical waveguides, and wherein said first and second sections are grating coupled to said network of optical waveguides.

36. (canceled)

37. (currently amended) A method for providing an optical interconnection amongst processing units of an electronic processor using an optical backplane, comprising the steps of:

guiding a polarized light in [[an]] a network of optical waveguides ~~network~~;

routing said polarized light [[in]] through vertexes of said network of optical waveguides by controllably rotating a polarization angle of said polarized light using a magneto optic rotator (MOR) and accepting said polarized light from said MOR and routing said light along an optical path in accordance with said polarization angle by a polarization beam splitter (PBS) which is seamlessly integrated into said optical waveguides ~~network~~; and

operationally connecting said processing units of said electronic processor to said network of optical waveguides by optical devices.

38. - 42. (canceled)

43. (new) The optical backplane of claim 21, wherein said PBS is a vertical polarization grating etched into said optical waveguides.

44. (new) The optical backplane of claim 21, wherein said PBS is a Brewster angle beam splitter etched into said optical waveguides.

45. (new) The optical backplane of claim 21, wherein said PBS is a birefringent prism built into said optical waveguides.

46. (new) The method for providing an optical interconnection of claim 37, further comprising the step of selecting said MOR to seamlessly mesh together with said optical waveguides into a coplanar configuration.

47. (new) In an electronic processor comprising a plurality of processing units, an optical backplane, comprising:

a network of optical waveguides for guiding a polarized light of a plurality of wavelengths;

a plurality of magneto optic rotators (MOR) for controllably rotating a polarization angle of said polarized light in vertexes of said network of optical waveguides, wherein said plurality of MOR are grating connected to said network of optical waveguides,

wherein each of said plurality of wavelengths is individually grating coupled to one MOR of said plurality of MOR, each MOR comprising:

(a), a first section, said first section comprising a magneto-optically active Yttrium Iron Garnet (YIG) layer guiding said polarized light, and a Gadolinium Gallium Garnet (GGG) layer interfacing with said YIG layer, wherein said GGG layer having a lower refractive index than said YIG layer, said first section further comprising a metallic strip, wherein said metallic strip substantially covering said first section, wherein a current flowing in said metallic strip generating a magnetic field in said first section, wherein said magnetic field being selectively switched between two modes, and wherein in said two modes said magnetic field has equal magnitudes and opposite directions, whereby in said first section said polarization angle is selectively rotated approximately by either + 45° or - 45°;

(b), a second section following said first section, wherein said second section comprising a second magneto-optically active YIG layer guiding said polarized light, and a second GGG layer interfacing with said second YIG layer, wherein said second GGG layer having a lower refractive index than said second YIG layer, and wherein in said second section a permanent magnetization prevails, whereby in said second section said polarization angle is rotated by approximately + 45°, whereby said polarization angle, upon said polarized light passing trough said first section and said second section, is selectively rotated approximately by either + 90° or by 0°;

a plurality of polarization beam splitters (PBS) for accepting said polarized light from said plurality of MOR, and routing said light according to said polarization angle; and

optical devices for operationally connecting said processing units of said electronic processor to said network, wherein said network affords an optical interconnection amongst said processing units.

48. (new) The optical backplane of claim 47, wherein said optical waveguides are planar waveguides.

49. (new) The optical backplane of claim 47, wherein said optical waveguides are strip waveguides.

50. (new) The optical backplane of claim 47, wherein said optical waveguides are cylindrical waveguides.

51. (new) The optical backplane of claim 47, wherein said network of optical waveguides comprising a doped $SiO_2$ layer guiding said polarized light, and an undoped $SiO_2$ layer interfacing with said doped $SiO_2$ layer, wherein said undoped $SiO_2$ layer having a lower refractive index than said doped $SiO_2$ layer.

52. (new) The optical backplane of claim 51, wherein said network of optical waveguides further comprising a third optical layer in a sandwich structure, wherein said doped $SiO_2$ layer being disposed between said undoped $SiO_2$ layer and said third optical layer, wherein said third optical layer having a lower refractive index than said doped $SiO_2$ layer.

53. (new) The optical backplane of claim 47, wherein said PBS is seamlessly integrated into said optical waveguides.

54. (new) The optical backplane of claim 53, wherein said PBS is a vertical polarization grating etched into said optical waveguides.

55. (new) The optical backplane of claim 53, wherein said PBS is a Brewster angle beam splitter etched into said optical waveguides.

56. (new) The optical backplane of claim 53, wherein said PBS is a birefringent prism built into said optical waveguides.

57. (new) The optical backplane of claim 53, wherein said PBS is having asymmetric waveguide output arms, wherein each of said waveguide output arms is capable of

propagating light only with one predetermined polarization angle.

58. (new) The optical backplane of claim 47, wherein said optical devices for operationally connecting said processing units comprise a prism coupling optics.

59. (new) The optical backplane of claim 47, wherein said optical devices for operationally connecting said processing units comprise a grating coupling optics.

60. (new) A method for providing an optical interconnection amongst processing units of an electronic processor using an optical backplane, comprising the steps of:

guiding a polarized light of a plurality of wavelengths in an network of optical waveguides;

routing said polarized light through vertexes of said network of optical waveguides by controllably rotating a polarization angle of said polarized light using a plurality of magneto optic rotators (MOR) which are connected to said network of optical waveguides by gratings, and coupling each of said plurality of wavelengths by said gratings to a corresponding MOR of said plurality of MOR, and accepting said polarized light from said MOR and routing said light along an optical path by a polarization beam splitter (PBS), in accordance with said polarization angle, wherein said controllable rotation of said polarization angle in each of said MOR comprises the steps of:

(a) using a first section, said first section comprising a magneto-optically active Yttrium Iron Garnet (YIG) layer guiding said polarized light, and a Gadolinium Gallium Garnet (GGG) layer interfacing with said YIG layer, wherein said GGG layer having a lower refractive index than said YIG layer, and selectively switching a magnetic field between two modes in said first section, wherein in said two modes said magnetic field has equal magnitudes and opposite directions, wherein in said first section said polarization angle is rotated approximately by either + 45° or by - 45°, and creating and switching said magnetic field by switching a current in a metallic strip which is substantially covering said first section;

(b), using a second section following said first section, wherein said second section comprising a second magneto-optically active YIG layer guiding said polarized light, and a second GGG layer interfacing with said second YIG layer, wherein said

second GGG layer having a lower refractive index than said second YIG layer, and rotating said polarization angle by approximately + 45° by prevailing a permanent magnetization in said second section, wherein upon said polarized light passing trough said first section and said second section it is selectively rotated approximately by either + 90° or by 0°; and

operationally connecting said processing units of said electronic processor to said network of optical waveguides by using optical devices.

61. (new) The method for providing an optical interconnection of claim 60, further comprising the step of selecting said PBS to seamlessly integrate into said optical waveguides.